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the tonal apparatus of the ear. It was further proved that a series of short and sharp sounds like those of a watchman's rattle, provided all extra accompanying sounds were fully damped, could be as rapid as 600 or more per second before producing an even tone. The corresponding parts of the ear leap into vibration at the first impulse, and as quickly subside. This makes possible a wide range of untonal sensations. If tone arises from continuous, even, and regular stimulation, noise arises from short, irregular and suddenly varying stimulation; and the two classes of sound pass into one another by insensible gradations. The complex noises, rustling, hissing, blowing, etc., can be reduced to noises as simple as those tested, differently combined, varied in quality, intensity and rapidity, and accompanied in differing degree by true tone. These experiments do not exclude the possibility of special organs for noise-hearing, but they seem to make their assumption, which is attended with difficulties, unnecessary.

Ein Kinesiæsthesiometer, nebst einigen Bemerkungen über den Muskelsinn. E. HITZIG. *Neurol. Centralblatt*, May 1 and 15, 1888.

The kinesiæsthesiometer, less formidable than its name might suggest, is a set of 17 wooden balls for testing "muscle-sense." The balls are about 7 cm. in diameter, and graded from 50 to 100 grs. by 10's, from 100 to 300 by 50's, and from 300 to 1000 by 100's. For use with the lower extremities, a stocking is provided with a pocket at the heel for the reception of the balls, the patient lying on his back during the experiment. The advantages of this device over others mentioned by the author consist in its easy and speedy application and in its portability. Previous measurements of the fineness of discrimination are discussed, and one tenth, the smallest difference for which this apparatus is adjusted, is taken as about the limit of sure discrimination with the upper extremities for normal subjects, and thus as an appropriate starting point for testing those whose sensibility is blunted by disease. For the lower extremities the limit is one tenth or more.

A large portion of the paper is taken up with a discussion of what is really measured in tests of this kind, and particularly of the hypothesis of a special central *Kraftsinn*. The author is not opposed to such an hypothesis—in fact, does not see how voluntary motion is to be explained without it—but at the same time does not believe that it is necessarily a conscious sensation, nor independent of the centripetal sensations from muscle, skin, and joint. He adds an interesting critique of arguments pro and con, together with three cases from which such a sense might hastily be deduced, but which on closer examination are inconclusive. In such experiments he considers one measures the sensations of movement in the most general meaning of the word, hence the name of his instrument.

Grundlinien zur Erforschung des Helligkeits- und Farbensinnes der Tiere. VITUS GRABER. Prag, Temsky; Leipzig, Freytag. 1884, pp. 332.

The question of the color-sense of animals has been put into a new stage of development by the admirable experimental work of Vitus Gruber. His investigation has hardly received the attention which it deserves, and it seems worth while to give a summary of his results, although they are already four years old.